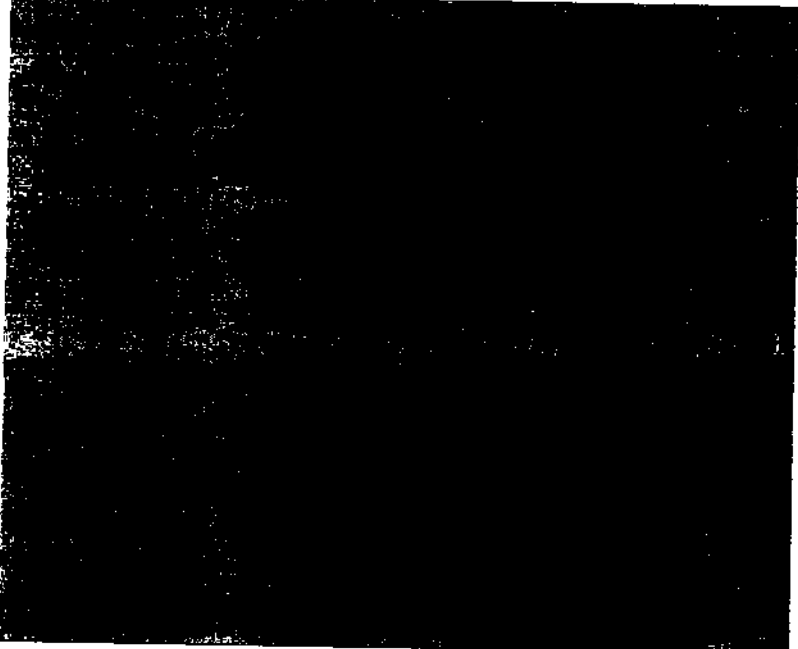


1

Time: 3Hrs

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Marks:-100

- N.B : (1) All questions are compulsory.  
(2) Figures to the right indicate maximum marks.  
(3) Use of non-programmable calculators is permitted.  
(4) Symbols used have their usual meaning

Q1.	A)	Select correct answer.	(12)
	1	d) $(1, \rho, 1)$	
	2	e) 6	
	3	a) dBm	
	4	c) $(\beta + 1)$	
	5	b) infinite CMRR and zero temperature drift	
	6	c) 1	
	B)	Answer in one sentence.	(03)
	1	$\nabla \times \vec{A} = 0$	
	2	infinity	
	3	Bandwidth of an op-amp is the range of frequency over which the voltage gain is equal to or greater than 70.7% of the maximum gain.	
	C)	Fill in the Blanks.	(5)
	1	Conservative or irrotational	
	2	$\rho dp d\theta dz$ or $r dr d\theta dz$	
	3	3	
	4	quiescent	
	5	triangular	
Q2.	A)	Attempt any one.	(8)
	1		



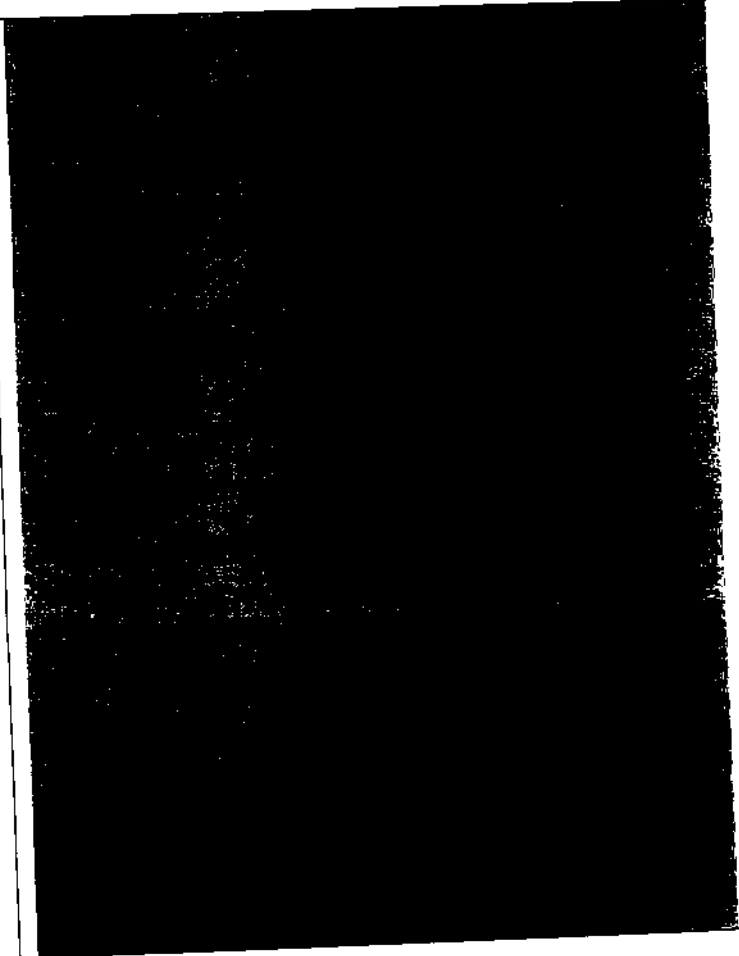
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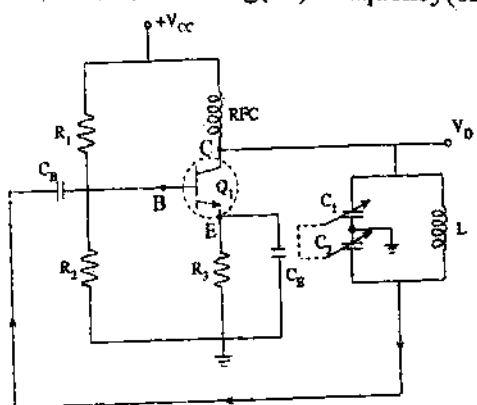
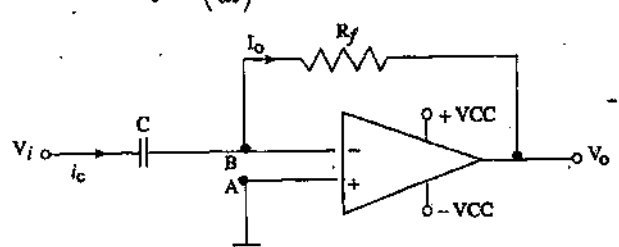
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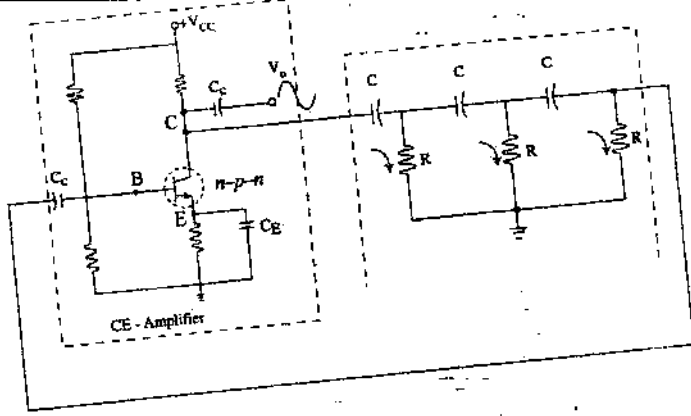
4

2		
		(4)
	C) Attempt any one.	
1	show $\int_P^Q \vec{F} \cdot d\vec{r} = V(Q) - V(P)$	
2	Calculate $I = \int (3x^2 dx - xy dy)$ over a) Straight line $y = x$ from (0,0) to (1,1) -----2 marks b) Parabola $y = x^2$ from (0,0) to (1,1) -----2 marks	
		(8)
Q3.	A) Attempt any one.	
1	Circuit diagram (1 marks) Expression for $I_B$ and $V_{CE}$ (4 marks) Stability factor (2 marks) Advantage & disadvantage (1 mark)	
2	Expression for the input resistance $R_i$ (3marks) Expression for the output resistance $R_o$ (3marks) Ideal values and reasoning (2 marks)	
		(8)
	B) Attempt any one.	
1	Circuit diagram of voltage divider bias (2 marks) Proof for stability factor equal to unity (5 marks) Advantage & disadvantage (1 mark)	
2	Block diagram (1 marks)	

5

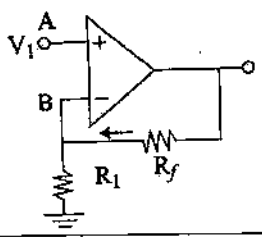
	Derivation (4 marks) Negative feedback effect on bandwidth (3 marks)	
C)	Attempt any one.	(4)
1	Formula $A_{vf} = \frac{A_v}{1+\beta}$ (1 mark) (i) voltage gain with feedback = 33.33 (1 mark) (ii) Feedback voltage = 0.08 (1 mark) (iii) output voltage = 1.33 (1 mark)	
2	Faithful amplification (1 mark) Conditions for faithful amplification (3 marks)	
Q4.	A) Attempt any one.	(8)
1	Diagram(03)+working(03)+frequency(02)  $f = \frac{1}{2\pi\sqrt{L C_{eq}}}$ $C_{eq} = \frac{C_1 C_2}{C_1 + C_2}$	
2	Definition(01)+diagram(02)+working(02)+derivation(03) $V_o = -R_f C \left(\frac{dV_i}{dt}\right)$ 	
B)	Attempt any one.	(8)
1	Definition(01)+diagram(03)+working(04)	

6



$$F = \frac{1}{2\pi\sqrt{6RC}}$$

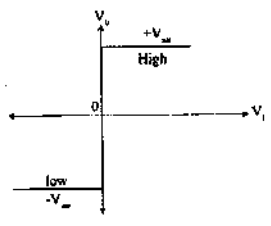
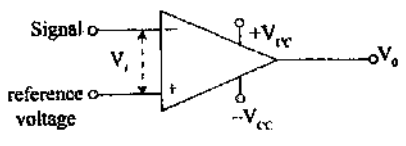
2 Definition(01)+diagram(03)+derivation(04)



C) Attempt any one.

(4)

1 Definition(01)+diagram(02)+characteristic(02)



2 op-amp inverting adder  
 $V_1 = 2V, V_2 = 3V$  and  $V_3 = 4V$ .  
 $R_1 = 4K\Omega, R_2 = 4K\Omega$  and  $R_3 = 4K\Omega, R_F = 5K\Omega$

$$V_o = -R_f \left[ \frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} \right]$$

$$= -11.25V$$

For averager,  $R_f = 1.66k\Omega$

Q5. Attempt any Four.

(20)

1 Statement-2  
 Explanation with diagram-3

7

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2			
3	$I_C = I_E = 1.73 \text{ mA}$ (2 marks) $V_C = 11.9 \text{ V}$ (1 mark) $V_{CE} = 14.6 \text{ V}$ (2 marks)		
4	Voltage gain = 30.10 dB Current gain = 20 dB Power gain = 25.05 dB		
5	$R_1 = 2\text{K}\Omega$ , $R_2 = 2.5\text{K}\Omega$ , $C_1 = 0.2\mu\text{F}$ and $C_2 = 0.4\mu\text{F}$ $f = \frac{1}{2\pi\sqrt{R_1 R_2 C_1 C_2}}$		1 mark
	$F = 2516\text{Hz}$		2 mark
	$C_{2\text{NEW}} = 0.8\mu\text{F}$		2 mark
	$F = 1780\text{Hz}$		
6	$R = 10\text{K}\Omega$ and $C = 2.2\mu\text{F}$ $V_i = 50\text{mV}$		1 mark
	$V_o = \frac{-t}{RC} V_i$		2 mark
	For $t = 1\text{ms}$ , $V_o = -2.27\text{V}$		2 mark
	For $V_o = -5\text{V}$ , $t = 2.2\text{ms}$		